

CLAIMS

1. Method for the preparation in a production line of a dairy product comprising a stage of introduction by continuous injection, via the production line, of at least one sterol and/or stanol ester at a given temperature T_1 , higher than or equal to the melting temperature of said ester, and in particular ranging from 35 to 80°C, into a dairy composition having a given temperature T_2 at least equal to T_1 , corresponding to an initial milk-based composition, containing milk proteins and without emulsifier, in order to obtain a mixture,

said stage of introduction of the sterol and/or stanol ester taking place before a stage of homogenization of said mixture.

2. Method according to claim 1, comprising a stage of continuous introduction of a sterol and/or stanol ester at a temperature T_1 ranging from 35 to 80°C, in particular from 40 to 70°C, and more particularly from 45 to 60°C, into the dairy composition as defined in claim 1.

3. Method for the preparation of a dairy product according to one of claims 1 or 2, characterized in that it comprises the following stages:

– a stage of preheating the initial composition as defined in claim 1, said preheating stage being carried out at a temperature T_2 of approximately 50°C to approximately 70°C, in particular approximately 55°C to approximately 65°C, and preferably being carried out at approximately 65°C, in order to obtain a dairy composition at the preheating temperature,

– a stage of continuous introduction by injection of the sterol and/or stanol ester at a temperature T_1 as defined in claim 1 or 2, into the abovementioned dairy composition at the preheating temperature, in order to obtain a mixture, and

– a stage of homogenization of said mixture.

4. Method for the preparation of a dairy product according to one of claims 1 to 2, characterized in that it comprises the following stages:

– a stage of heating a dairy composition corresponding to an initial milk-based composition, containing milk proteins and without emulsifier, said heating stage being

carried out at a temperature T_2 of approximately 85°C to approximately 100°C, in particular approximately 87°C to approximately 97°C, advantageously approximately 87°C to approximately 95°C, and preferably being carried out at approximately 95°C, in order to obtain a dairy composition at the heating temperature,

5 – a stage of introduction of the sterol and/or stanol ester at a temperature T_1 defined in claims 1 to 3, into the abovementioned dairy composition at the heating temperature, in order to obtain a mixture, and

 – a stage of homogenization of said mixture.

10 5. Method for the preparation of a dairy product according to one of claims 1 to 2, characterized in that it comprises the following stages:

 – a stage of heating a dairy composition corresponding to an initial milk-based composition, containing milk proteins and without emulsifier, said heating stage being carried out at a temperature T_2 of approximately 85°C to approximately 100°C, in particular approximately 87°C to approximately 97°C, advantageously approximately 87°C to approximately 95°C, and preferably being carried out at approximately 95°C, in order to obtain a dairy composition at the heating temperature,

15 – a stage of introduction of the sterol and/or stanol ester at a temperature T_1 defined in claims 1 to 3, into the abovementioned dairy composition at the heating temperature, in order to obtain a mixture, and

20 – a stage of holding said mixture, said holding stage being carried out for a period sufficient to maintain the dairy composition originating from the heating stage for a period at the heating temperature, sufficient to destroy the vegetative microbial flora, in order to obtain a held mixture, and

25 – a stage of homogenization of the abovementioned held mixture.

 6. Method for the preparation of a dairy product according to one of claims 1, 2 or 5, characterized in that it comprises the following stages:

30 – a stage of preheating an initial milk-based composition, containing milk proteins and without emulsifier, at a preheating temperature of approximately 50°C to approximately 70°C, in particular approximately 55°C to approximately 65°C, and preferably being carried out at approximately 65°C, in order to obtain a dairy composition at the preheating temperature,

– a stage of introduction into the abovementioned dairy composition at the preheating temperature, of at least one sterol and/or stanol ester at the temperature T_1 defined in claim 2, in order to obtain a mixture,

– a stage of homogenization of the abovementioned mixture at a pressure of approximately 100 bars to approximately 280 bars, in particular approximately 100 bars to approximately 250 bars, advantageously approximately 100 bars to approximately 200 bars, and preferably approximately 200 bars, in order to obtain a homogenized mixture,

– a stage of heating the abovementioned homogenized mixture, said heating being carried out at a heating temperature of approximately 85°C to approximately 100°C, in particular approximately 87°C to approximately 97°C, advantageously approximately 87°C to approximately 95°C, and preferably being carried out at approximately 95°C, in order to obtain a heated homogenized mixture, and

– a stage of holding the abovementioned heated homogenized mixture, in order to obtain a heated and homogenized held mixture.

7. Method according to claim 6, in which the holding stage is followed by the following stages:

– a stage of fermentation of the heated and homogenized held mixture as defined in claim 5, carried out at a temperature of approximately 30°C to approximately 47°C, in particular approximately 35°C to approximately 45°C, and preferably approximately 38°C to approximately 42°C, in order to obtain a fermented mixture, and

– an optional stage of smoothing the abovementioned fermented mixture, in order to obtain a final white mass, comprising a fatty phase, corresponding to the sterol and/or stanol ester, included by the homogenization stage in the protein network formed by the milk proteins and the milk of the abovementioned initial composition as defined in claim 1, said final white mass being characterized in that it exhibits homogeneity between the fatty phase and the protein network, and exhibits no phase difference between the aqueous phase and the protein network.

8. Method according to claim 7, in which the smoothing stage is followed by a stage corresponding to the addition of a fruit preparation without sterol and/or stanol in any form whatever.

9. Method according to claim 7, in which the smoothing stage is followed by a stage corresponding to the addition of a cereal composition without sterol and/or stanol in any form whatever.

5 10. Method according to claim 8, characterized in that the fruit preparation comprises a thickener, in particular chosen from: xanthan gum, pectin, starch, in particular gelatinized, gelan gum, cellulose and its derivatives, guar and carob gum, and inulin, the concentration of these thickeners being approximately 0.4% to approximately 3% relative to the fruit preparation.

10 11. Method for the preparation of a dairy product according to claim 1 or 2, characterized in that it comprises the following stages:

– a stage of preheating an initial milk-based composition, containing milk proteins and without emulsifier, at a preheating temperature T_2 of approximately 50°C to approximately 70°C, in particular approximately 55°C to approximately 65°C, and preferably being carried out at approximately 65°C, in order to obtain a dairy composition at the preheating temperature,

– a stage of introduction into the abovementioned dairy composition of at least one sterol ester at a temperature T_1 defined in claim 2, in order to obtain a mixture,

20 – a stage of homogenization of the abovementioned mixture at a pressure of approximately 100 bars to approximately 280 bars, in particular approximately 100 bars to approximately 250 bars, advantageously approximately 100 bars to approximately 200 bars, and preferably approximately 200 bars, in order to obtain a homogenized mixture,

25 – a stage of heating the abovementioned homogenized mixture, said heating being carried out at a heating temperature of approximately 85°C to approximately 100°C, in particular approximately 87°C to approximately 97°C, advantageously approximately 87°C to approximately 95°C, and preferably being carried out at approximately 95°C, in order to obtain a heated homogenized mixture, and

30 – a stage of holding the abovementioned heated homogenized mixture, said holding stage being carried out for a duration of approximately 4 minutes to approximately 10 minutes, in particular approximately 5 to approximately 8 minutes, and preferably being carried out for approximately 6 minutes, in order to obtain a heated and homogenized held mixture,

– a stage of fermentation of the abovementioned heated and homogenized held mixture, carried out at a temperature of approximately 30°C to approximately 47°C, in particular approximately 35°C to approximately 45°C, and preferably approximately 38°C to approximately 42°C, in order to obtain a fermented mixture, and

– an optional stage of smoothing the abovementioned fermented mixture, in order to obtain a final white mass, comprising a fatty phase, corresponding to the sterol and/or stanol ester, included by the homogenization stage in the protein network formed by the milk proteins and the milk of the abovementioned initial composition as defined in claim 1, said final white mass being characterized in that it exhibits a homogeneity between the fatty phase and the protein network, and exhibits no phase difference between the aqueous phase and the protein network.

12. Method according to claim 11, characterized in that the initial composition is without thickener.

13. Method for the preparation of a dairy product according to claim 1 or 2, characterized in that it comprises the following stages:

– a stage of preheating an initial milk-based composition, containing milk proteins and without emulsifier, at a temperature T_2 of preheating of approximately 50°C to approximately 70°C, in particular approximately 55°C to approximately 65°C, and preferably being carried out at approximately 65°C, in order to obtain a dairy composition at the preheating temperature,

– a stage of introduction into the abovementioned dairy composition of at least one sterol and/or stanol ester at a temperature T_1 defined in claim 2, in order to obtain a mixture,

– a stage of homogenization of the abovementioned mixture at a pressure of approximately 100 bars to approximately 280 bars, in particular approximately 100 bars to approximately 250 bars, advantageously approximately 100 bars to approximately 200 bars, and preferably approximately 200 bars, in order to obtain a homogenized mixture,

– a stage of heating the abovementioned homogenized mixture, said heating being carried out at a heating temperature of approximately 85°C to approximately 100°C, in particular approximately 87°C to approximately 97°C, advantageously

approximately 87°C to approximately 95°C, and preferably being carried out at approximately 95°C, in order to obtain a heated homogenized mixture, and

– a stage of holding the abovementioned heated homogenized mixture, said holding stage being carried out for a duration of approximately 4 minutes to approximately 10 minutes, in particular approximately 5 to approximately 8 minutes, and preferably being carried out for approximately 6 minutes, in order to obtain a heated and homogenized held mixture,

– a stage of fermentation of the abovementioned heated and homogenized held mixture, carried out at a temperature of approximately 30°C to approximately 47°C, in particular approximately 35°C to approximately 45°C, and preferably approximately 38°C to approximately 42°C, in order to obtain a fermented mixture, and

– a stage of smoothing the abovementioned fermented mixture, in order to obtain a final white mass, comprising a fatty phase, corresponding to the sterol and/or stanol ester, included by the homogenization stage in the protein network formed by the milk proteins and the milk of the abovementioned initial composition as defined in claim 1, said final white mass being characterized in that it exhibits a homogeneity between the fatty phase and the protein network, and exhibits no phase difference between the aqueous phase and the protein network, and

– a stage of addition of a fruit preparation without sterol and/or stanol in any form whatever.

14. Method according to claim 13, characterized in that the fruit preparation contains a thickener, in particular chosen from: alginates, xanthan gum, pectin, starch, in particular gelatinized, gelan gum, cellulose and its derivatives, guar and carob gum, and inulin, the concentration of these thickeners being approximately 0.4% to approximately 3% relative to the fruit preparation.

15. Method according to any one of the preceding claims 1 to 14, characterized in that the initial composition comprises milk, milk powder, milk proteins and an agent in a concentration such that it limits syneresis, said agent being in particular chosen from: the alginates, maltodextrins, pectins, soluble fibres, starch and inulin, and preferably being starch.

16. Method according to any one of claims 1 to 15, characterized in that the sterol and/or stanol ester is chosen from the group comprising: 22-dihydroergosterol, 7.24(28)-ergostadienol, campesterol, neospongosterol, 7-ergosterol, cerebisterol, corbisterol, stigmasterol, flocosterol, α -spinasterol, sargasterol, 7-dehydrocryonasterol, poriferasterol, chondrillasterol, β -sitosterol, cryonasterol (γ -sitosterol), 7-stigmasternol, 22-stigmastenol, dihydro- γ -sitosterol, β -sitostanol, 14-dehydroergosterol, 24(28)-dehydroergosterol, ergosterol, brassicasterol, ascosterol, episterol, fecosterol and 5-dihydroergosterol, and their mixtures and is advantageously β -sitosterol, β -sitostanol, β -sitostanol ester, campesterol or brassicasterol.

17. Method according to any one of claims 1 to 16, characterized in that the ratio of the sterol and/or stanol ester flow rate to the initial milk-based composition flow rate ranges from approximately 0.5 to approximately 3.

18. Product as obtained according to the method according to one of claims 1 to 17.

19. Product as obtained according to the method according to claim 11 or 12, being presented in the form of a dairy product of firm natural yogurt type.

20. Product as obtained according to the method according to claim 13 or 14, being presented in the form of a dairy product of stirred natural or fruit yogurt type or drinking yogurt type.

21. Product according to one of claims 18 to 20, containing approximately 0.1% to approximately 3% sterol and/or stanol ester, and in particular approximately 0.5% to approximately 2.5% sterol and/or stanol ester, advantageously approximately 1% to approximately 1.6% sterol and/or stanol ester.

22. Device for the implementation of the method according to one of claims 1 to 17, for the continuous introduction, via a production line, of at least one sterol and/or stanol ester at a given temperature T_1 , higher than or equal to the melting temperature of said ester, and in particular ranging from 35 to 80°C, into a dairy composition at a

temperature T_2 higher than or equal to the temperature T_1 , characterized in that it comprises the following elements:

– means making it possible to maintain the abovementioned sterol and/or stanol ester at the temperature T_1 , such as a heat-insulated tank or a thermostatically controlled vat,

– means making it possible to circulate said ester towards a production-line supply means, whilst maintaining said ester at the temperature T_1 , such as a heat-insulated tube, and

– supply means making it possible to introduce said ester at the temperature T_1 , into the production line, such as a positive pump.

23. Device according to claim 22, comprising the means of circulation of the dairy composition heated to the abovementioned temperature T_2 , and in which the pump circulates the ester at a flow rate proportional to the circulation flow rate of the abovementioned dairy composition heated to the temperature T_2 .